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IS 9249-2 (1982): Safety requirements for indicating and recording electrical measuring instruments and their accessories, Part 2: Safety requirements for instruments using a mains supply [ETD 12: Measuring Equipment for Basic Electrical Quantities]

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(Reaffirmed 2002)

Indian Standard

SAFETY REQUIREMENTS FOR INDICATING AND RECORDING ELECTRICAL MEASURING INSTRUMENTS AND THEIR ACCESSORIES

PART II SAFETY REQUIREMENTS FOR INSTRUMENTS USING A MAINS SUPPLY

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PART II SAFETY REQUIREMENTS FOR INSTRUMENTS USING A MAINS SUPPLY

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Indian Standard

SAFETY REQUIREMENTS FOR INDICATING AND RECORDING ELECTRICAL MEASURING INSTRUMENTS AND THEIR ACCESSORIES

PART II SAFETY REQUIREMENTS FOR INSTRUMENTS USING A MAINS SUPPLY

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 28 April 1982, after the draft finalized by the Electrical Equipment Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 This standard (Part II) covers the safety requirements of indicating and recording instruments using a mains supply. This part should be read in conjunction with Part I, which covers common safety requirements for instruments and their accessories.

0.3 In the preparation of this standard (Part II) considerable assistance has been derived from IEC Pub 414 (1973) 'Safety requirements for indicating and recording electrical measuring instruments and their accessories' issued by the International Electrotechnical Commission.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard (Part II) covers safety requirements and test for compliance to the following electrical measuring instruments using a mains supply:

a) Direct acting indicating instruments,

b) Direct acting recording instruments,

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*Rules for rounding off numerical values (*revised*).

c) Indirect acting instruments, and

d) Certain accessories used with these instruments.

2. TERMINOLOGY

2.0 For the purpose of this standard the following definitions shall apply in addition to those given in IS : 9249 (Part I)-1979*.

2.1 Functional Insulation — Insulation necessary for the proper functioning of equipment and for basic protection against electric shock.

2.2 Supplementary Insulation — Independent insulation provided in addition to the functional insulation, in order to ensure protection against electric shock in the case of failure of the functional insulation.

2.3 Double Insulation — Insulation comprising both functional insulation and supplementary insulation.

2.4 Instrument with Additional Insulation — Denotes an instrument with double insulation and/or reinforced insulation throughout and without provision for protective earthing, and in which a durable and substantially continuous enclosure of insulating material envelopes all conductive parts, except small parts such as name plates, screws or rivets, which are isolated from live parts by insulation at least equivalent to reinforced insulation. Terminals are not considered here.

NOTE — The construction of metal-encased instruments with additional insulation is not recommended.

3. GENERAL REQUIREMENTS AND TESTS

3.0 In addition to the general requirement and tests specified in Part I, the following shall apply.

3.1 Separation from Measuring Circuits

3.1.1 Mains supply circuits whose voltage exceeds extra-low voltage shall be separated from measuring circuits whose test voltage is less than 1·5 kV. One of the following methods or a combination of them shall be employed.

a) An independent insulating barrier provided in addition to functional insulation (*see* **3.2**);

b) A continuous metal screen which is connected to the protective earth terminal; and

c) A built-in safety (isolating) transformer.

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*Safety requirements for indicating and recording electrical measuring instruments and their accessories: Part I Common safety requirements for instruments.

Compliance shall be checked by inspection. Safety (isolating) transformers shall be inspected for conformity with IS : 1416-1972*.

3.2 Requirements for Instruments with Additional Insulation

3.2.1 These instruments shall not be provided with a protective earth terminal.

3.2.2 Voltage tests on these instruments shall be performed with twice the values given in Table 2 of IS : 9249 (Part I)-1979†.

3.2.3 Clearances and creepage distances between live parts and the surface of the enclosure shall have at least twice the values given in Table 1.

3.2.4 Where the functional and supplementary insulations are to be tested separately, 100 percent of the values given in Table 2 of IS : 9249 (Part I)-1979† and Table 1 of this standard shall apply to each of them.

TABLE 1 MINIMUM CLEARANCES AND CREEPAGE DISTANCES

VOLTAGE (V)	CLEARANCE (mm)	CREEPAGE DISTANCE (mm)
Up to and including 25	1·0	1·0
Over 25 up to and including 50	1·5	1·5
Over 50 up to and including 250	2·5	2·5
Over 250 up to and including 450	3.5	4·0
Over 450 up to and including 650	4·0	5·0
Over 650 up to and including 1 000	5·5	8·0
Over 1 000 up to and including 1 500	8·5	12·0
Over 1 500 up to and including 2 000	11·0	16·0
Over 2 000 up to and including 3 000	17·0	24·0
Over 3 000 up to and including 4 000	22·0	32·0
Over 4 000 up to and including 5 000	28·0	40·0
Over 5 000 up to and including 6 000	34·0	48·0

3.2.5 Instruments with additional insulation shall be marked with symbol C-6 [*see* Table 3 of IS : 9249 (Part I)-1979†].

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*Specification for safety transformers (*first revision*).

†Safety requirements for indicating and recording electrical measuring instruments and their accessories: Part I Common safety requirements for instruments.

3.3 Voltage Setting of Mains Supply

3.3.1 Instruments shall be so constructed that changing of the setting from one voltage to another or from one nature of supply to another is unlikely to occur accidentally.

Compliance shall be checked by inspection and by manual test.

3.4 Protective Earth Connection

3.4.1 Instruments with accessible conductive parts and with mains supply exceeding extra-low voltage shall be provided with means for protective earth connection. The means shall comply with the requirements of **5.4.1** and **8.2** of IS:9249 (Part I)-1979*.

3.4.2 For instruments provided with a connector for the mains supply, the earth contact shall be an integral part of it and shall be so designed that the protective earth connection is established before any other connection, and is disconnected after any other connection.

For a three-core mains supply cord terminal, the earth contact shall be equivalent to the supply mains terminals and shall allow the connection of a conductor of the same cross-section as the supply mains conductors, which may be less than 4 mm^2 [*see* **8.2** (a) of IS:9249 (Part I)-1979*].

3.4.3 For instruments to be connected to fixed wiring or provided with a non-detachable flexible cord or cable, the earth terminal shall be adjacent to the mains terminals.

Compliance shall be checked by inspection and by manual test.

3.5 External Cords for Mains Supply

3.5.1 The instrument shall allow the external flexible cords to be so connected that the connecting points of the conductors are relieved from strain, the outer covering is protected from abrasion, and the conductors are protected from twisting.

The instrument shall allow the external flexible cords to be so relieved from strain that no appreciable mechanical force is exerted on the cable insulation by parts electrically connected to accessible conductive parts, unless an additional insulation is provided.

Compliance shall be checked by inspection. Pull and torque tests may be agreed upon.

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*Safety requirements for indicating and recording electrical measuring instruments and their accessories: Part I Common safety requirements for instruments.

3.5.2 Plugs of supply cords of instruments intended to be fed by supply sources energizing solely the instrument concerned shall not fit into mains systems with higher voltages than the intended one.

Compliance shall be checked by inspection.

4. MARKING

4.1 Instruments with mains supply shall be marked with the following information:

a) Nature of supply:

  1) ac only: rated mains frequency (or range of frequencies); and

  2) dc only with symbol **B-1** [*see* Table 3 of IS:9249 (Part I)-1979*].

b) Rated supply voltage (or range of voltages). For three-phase supplies, it is the line-to-line voltage.

NOTE — For information purposes, it may be useful.

  1) to mark ac instruments with symbol **B-2** of Table 3 of IS:9249 (Part I)-1979*.

  2) to mark three-phase ac instruments with symbol **B-4** of Table 3 of IS:9249 (Part I)-1979*, and

  3) to mark instruments suitable for both ac and dc with symbol **B-3** of Table 3 of IS:9249 (Part I)-1979*.

4.2 The marking shall comply with the requirements specified in **9** of IS:9249 (Part I)-1979*.

Compliance shall be checked by inspection and as a routine test.

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*Safety requirements for indicating and recording electrical measuring instruments and their accessories: Part I Common safety requirements for instruments.

INDIAN STANDARDS ON ELECTRICAL INSTRUMENTS

IS:	
1248-1968	Direct acting electrical indicating instruments (*first revision*)
1565-1966	Electrical apparatus comprising resistors (*revised*)
1765-1980	dc potentiometers for laboratory and industrial use (*second revision*)
1885 (Part XI)-1966	Electrotechnical vocabulary: Part XI Electrical measurements
2032 (Part X)-1969	Graphical symbols used in electrotechnology: Part X Measuring instruments
2419-1979	Dimensions for panel mounted indicating and recording electrical instruments (*first revision*)
2442-1963	dc moving coil galvanometers
2992-1980	Insulation resistance testers (magneto generator type) (*first revision*)
3107-1974	Portable multi-purpose direct acting electrical indicating instruments (*first revision*)
3635-1966	Methods of test for resistance of metallic electrical resistance material
3636-1966	Method of test for temperature co-efficient of precision resistor wires
6236-1971	Direct recording electrical measuring instruments
7889-1975	Vibration galvanometers
7890-1975	Ballistic galvanometers
7914-1975	Standard cells
8143-1976	Plugs and keys for resistance boxes
8160-1976	Tangent galvanometers
8197-1976	Terminal markings for electrical measuring instruments and their accessories
8945-1978	Electrical instruments for hazardous atmospheres
9051-1979	Rheostats
9223-1979	Earth resistance meters
9249 (Part I)-1979	Safety requirements for indicating and recording electrical measuring instruments and their accessories: Part I Common safety requirements for instruments